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a 16-page booklet published in Moscow in 1961 entitled "Prospect" describing the 17 departments of the Institute of Microbiology, Moscow, USSR. The document lists the departments and their chiefs and notes different types of research activity involved in each department. Three of the pages are devoted to a bibliography listing periodicals and articles published by the institute. UNCLASSIFIED.

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USSR ACADEMY OF SCIENCES

INSTITUTE OF MICROBIOLOGY

PROSPECT

MOSCOW — 1961

USSR ACADEMY OF SCIENCES

INSTITUTE OF MICROBIOLOGY

P R O S P E C T

Moscow — 1961

The Institute of Microbiology of the USSR Academy of Sciences was founded in 1930 in Leningrad. It existed then as a microbiological laboratory ~~of the Institute of Experimental Medicine~~. The Head of the laboratory was G. A. Nadson.

In 1934 this laboratory was transferred to Moscow. At the same time it was enlarged by inviting distinguished specialists in biochemistry and physiology (V. A. Butkevich, A. R. Kisel, V. N. Shaposhnikov). Since then it is called the Institute of Microbiology.

In 1937-1948 the Director of the Institute was B. L. Issachenko, a prominent specialist in general and geological microbiology. Since 1948 A. A. Imsheneckii is the Director of the Institute. The Institute is continuously enlarged. In 1955 the Staff of research workers numbered 67 person. Now it numbers 112 person. In 1960 a decision was accepted to enlarge the Institute and to increase the number of scientific departments from 10 to 16. At the same time an experimental pilot plant and a division for physical and chemical research methods were established.

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RESEARCH ACTIVITY

DEPARTMENT OF EXPERIMENTAL VARIABILITY OF MICROORGANISMS.

Head: A. A. Imsheneckii.

Principles and methods of hereditary changes in microbial metabolism are studied with the aim to obtain useful forms.

To obtain altered forms of microorganisms UV rays are used. Morphological and physiological peculiarities of mutants obtained are studied in order to find out correlation in morphological and physiological characteristics. Specific action of UV rays on formation of variants in moulds as well as uses of physical and chemical factors combination to obtain high-yield producers of citric acid and gibberelin are studied. At the same time stability of morphological and physiological characteristics in variants obtained is under study. Transformation by means of specific deoxypentosenucleic acid is used as one of the methods to obtain variants with increased enzyme activity (proteinase, protopectinase etc.). Comparative physiological and biochemical study of transformants so obtained is carried out.

► Nitrogen and carbohydrate metabolism of fumaric acid producing moulds is studied in order to find out optimal conditions for fermentation and subsequent practical uses of fumaric acid.

• The microbial synthesis of amino-acids is studied as well as screening methods for active producers and their physiological and biochemical characteristics.

• The experiments in physiology of *Nitrosomonas* and on conditions favouring formation of peculiar morphological forms of this organism are continued. Comparative study of nuclear body in Eubacteriales and Myxobacteriales is performed. Morphology of nucleoid as affected by various fixation procedures is under study.

DEPARTMENT OF TECHNICAL MICROBIOLOGY

Head: V. N. Shaposhnikov.

The work of this department is primarily concerned with the regularities in metabolism of industrially useful microorganisms. The physiology of microorganisms producing antibiotics (streptomycin, violarin), vitamin B₁₂, amino- and keto-acids, carotenoids is studied. Actinomycetes and bacteria are the objects of study. As a methodical approach, the study of chemical changes in growing cultures is used. The effect of inorganic (potassium, phosphorus) as well as organic (inositol, vitamin B₁₂, proline, organic acids) components of the medium on biosynthesis of streptomycin molecule is studied. Phosphorus metabolism of *Actinomyces streptomycini* on various media is under study. Large work is concerned with phasic processes in microorganisms according to conditions of growth and composition of the medium. Relation of biosynthesis of interesting metabolites to the phase of growth, catabolism and anabolism is studied with the aim to regulate these processes. A technique of continuous flow cultivation of actinomycetes is being developed.

The regularities in vitamin B₁₂ production by actinomycetes and propionic acid bacteria are studied. The following questions are examined: The distribution of vitamin in cells and in cultural fluid on synthetic media according to their composition. Effect of trace elements and precursor (5,6-dimethylbenzimidazole) on total output and relative amount of various vitamin B₁₂ forms.

Some work is carried out dealing with physiology of photoautotrophic bacterium *Chromatium vinosum*. (The pathways of organic acid carbon utilisation, effect of light intensity on reproduction).

Use of distilleries and acetone-butyl production wastes as well as wood flour hydrolisates for production vitamin-rich feed for animals is also studied.

DEPARTMENT OF MICROORGANISMS INTERACTION

Head: N. A. Krassilnikov.

The research is carried out along three main directions:

1. Development of basic principles in taxonomy of ray fungi and other microorganisms.

2. Investigation of the possibility to use biochemical features as basic features in species characterisation. For this reason production of biologically active substances (antibiotics, hormones, aminoacids etc.) by various microorganisms is studied.

3. Establishment of regularities in actinomycetes widespread. Study of biological effect of certain microorganisms on higher plants.

DEPARTMENT OF PHYSIOLOGICAL CYTOLOGY OF MICROORGANISMS

Head: M. N. Meissel.

The main problems under study are: structural and ultra-structural organization of microbial cell, functional role of organelle structures within microbial cell as well as changes in these structures following various phases of physiological activity and application of various external physical and chemical treatments. As for radiation microbiology the regularities in structural, physiological, and biochemical changes in microorganisms in the course of inactivation and reactivation are investigated with the aim to find out the initial effect of radiation injury and to apply irradiation as a tool in technical microbiology. The functional morphology of yeast cell is studied under aerobic and anaerobic conditions. Cytology of vitamindeficient and hyper-vitaminous state in microbial cell is one the questions under study. Special attention is directed toward development of fluorescent microscopy, its application in microbial cytology and cytochemistry as well as development of microbiological methods of water-soluble vitamins assay.

DEPARTMENT OF VIRUSES

Head: V. L. Ryzkov.

The research programme of this department deals with phytopathogenic viruses, polyhedric diseases of silkworm and some questions in phytooncology.

Physiological conditions of virus reproduction is one of the main questions under study. The effect of various metabolites

and antimetabolites on the growth of silkworm and polyhedric virus reproduction are studied. Virological, chemical as well as cytochemical methods are used.

As for phytopathogenic viruses the relation of virus reproduction to the phase of plant growth is studied. A question under study is the interaction of tobacco mosaic virus and its infectious nucleic acid with various cell organoids and chemical constituents of the cell.

Another line of research deals with identification and classification of phytopathogenic viruses. Various species and strains of infectious viruses causing stolbur and stolbur-like diseases in plants are studied comparatively. Much attention is paid to various strains of tobacco mosaic virus and viruses pathogenic for potatoe. Virological methods as well as light and electron microscopy of virus inclusions in cell are used.

Relation between normal and malignant growth is studied in the field of phytooncology.

Alongside with experimental work some theoretical study is carried out dealing with phylogenetical systematic of viruses and determination of virus place in Nature.

DEPARTMENT OF GEOLOGICAL
ACTIVITY OF MICROORGANISMS.

Head: S. I. Kusnezov.

Study of microorganisms in oil and gaseous beds is one of the main lines of research in this department. It was found that bacteria which grow aerobically on heavy oil fractions are capable to use light fractions as well. Data have been obtained indicating that microorganisms do not participate in the process of ozokerite formation from oil. At high redox-potential values microorganisms do oxidize oil and ozokerite.

The hydrogen sulphide gas formation in oil crevices under the action of sulphate-reducing bacteria is studied in large oil beds. Investigation are carried out on physiology and ecology of bacteria in relation to formation and oxidation of sulfur and sulphide ores. Oxidation of Ti- and Zn-sulphides is investigated in laboratory conditions.

Another line of research deals with phenomenon of lysis in microalgae (*Chlorella*) and its causative agents.

DEPARTMENT OF SOIL MICROORGANISMS

Head: E. H. Mishustin.

There are three main lines in research in this department: ecological-geographical regularities in microorganisms widespread; phenomenon of symbiotrophy and microorganisms; microorganisms and soil processes.

The effect of ecological and geographical conditions on the formation of microbe's associations is studied in connection with the first question. The species composition of the microflora in different soils is determined.

Group- and species composition of the rhizosphere as well as that of mycorrhiza-forming fungi of various plants are studied. Physiological and biochemical features of symbiotic microorganisms and effect of their metabolites on higher plant are investigated. The research embraces useful microorganisms which increase the amount of nitrogen in the soil and decompose phosphor-organic substances.

As for the role of microorganisms in soil processes attention is focused on the participation of various groups of soil microflora in synthesis and decomposition of soil organic matter. At the same time ecological and geographical conditions favouring those processes are studied. The peculiarities in structure of humic substances from various substrata and the pathways of their decomposition are followed.

DEPARTMENT OF MARINE MICROBIOLOGY

Head: A. E. Kriss

The department of Marine Microbiology studies ecological-geographical regularities of microorganism distribution in the world ocean as well as physiology of marine microorganisms reproducing under high pressures.

Microbiological investigations have been carried out in the North Pole area of the Arctic Ocean, in the Pacific, Indian, Atlantic and Antarctic Oceans and in the Black, Caspian, Okhotsk, Norwegian, Greenland, East-Siberian, Chukotsk and Bering Seas.

The water column from the surface to the bottom as well as bottom deposits in the open sea and ocean areas far from land have been studied. The investigations have embraced all geogra-

phical zones of the world ocean, i. e. from the North Pole down to Antarktic.

As a result, data have been obtained on the quantity and species of microorganisms at various sea and ocean depths, on the areals of microbial species and on the regularities in the geographical distribution of microorganisms. A new class of microorganisms inhabiting deep areas of the world ocean has been found. The possibility of using microorganisms as sensitive indicators of deep weak currents has been elucidated. Barotolerant bacteria have been found to accelerate sharply the processes of organic matter transformation and change their metabolism when being cultured under pressures of some hundred atmospheres.

DEPARTMENT OF PHYSIOLOGY OF GROWTH AND DEVELOPMENT OF MICROORGANISMS

Head: N. D. Ierusalimsky.

Relations existing between environmental conditions and physiology of microbial cell (rate of growth, chemical composition, structure, various biochemical activities etc.) are in the forefront of interest in this department. Special techniques are used which provide the maintenance of strictly controlled conditions of experiments: continuous flow cultivation, cultivation in changeable media, synchronisation of cell division, flowing through microcamera. Research works were carried out dealing with spore formation in bacilli, adaptation of bacteria to toxic substances and antimetabolites etc. At present the conditions for vitamin B₁₂ biosynthesis and its role in the cell are studied.

DEPARTMENT OF TYPE CULTURE COLLECTION

Head: V. I. Kudrijavzev.

The main task of this department is to organize the All-Union type culture collection of bacteria, yeasts, moulds and actinomycetes which are described in the USSR or abroad and which are of academic or industrial importance.

**DEPARTMENT OF BACTERIOPHAGY
AND ACTINOPHAGY.**

Head: Y. I. Rautenstein.

Research is carried out in this department dealing with widespread of actinophages and certain bacteriophages in nature, their biological role, study of the lysogen in actinomycetes and bacteria and the variability actinomycetes under phage action. The variability of actinophages either in free or intracellular state are studied. Methods of actinophage application in actinomycetes systematic are being developed. The fine structure of phages is studied. The possibility of using phages for microbial cell disruption and obtaining enzymes and other cell components is investigated.

**DEPARTMENT OF TRANSFORMATION
OF STEROIDS AND OTHER
ORGANIC COMPOUNDS**

Head: G. K. Skrijabin.

The task of this department is to find theoretical basis for use of biochemical activities of microorganisms in transformation of various organic compounds, especially those with high biological activity (hormones, vitamins, antibiotics etc.).

At the time being the work is concerned with microbiological transformation of steroids. The programme is aimed at isolation of microorganisms active in various transformations of steroid molecule, at study of enzymes taking part in transformation and mechanism of their action, use of cell — free preparation.

Nature of physiological specificity in transformation and the possibility to guide the process of transformation are considered as questions of high importance.

**DEPARTMENT OF PHYSIOLOGY
OF CHEMOAUTOTROPHIC MICROORGANISMS**

Head: G. A. Zavorsin.

Development of methods for chemoautotrophic microorganisms cultivation is the main line of research. Special interest is centered around iron bacteria and manganese-oxidizing orga-

nisms. Pure cultures are isolated, physiology of their growth is studied and investigation of their biochemical characteristics are planned.

A peculiar microorganism has been isolated and named *Metallogeinium symbioticum*. This organism despite of its ability for anorgoxidation can grow only in symbiosis with a fungus. *M. symbioticum* oxidises manganese intensively. According to observation of number of Soviet investigators it plays an important part in manganese circle in fresh water lakes. Morphology and physiology of this organism are studied.

DEPARTMENT OF THERMOPHILIC MICROORGANISMS

Head: L. G. Loginova.

The study of thermophilic microorganisms (i. e. those able to grow at 40-85°C) is important because these microorganisms can grow rapidly and can be characterized as very active biochemically. Thermophilic microorganisms are isolated from nature and obtained experimentally. The mechanisms which provides the existance of these microorganisms at high temperatures is studied. Optimal conditions for culturing vand preservation are studied.

DEPARTMENT OF ADAPTATION IN MICROORGANISMS

Head: U. N. Karassevich.

The main topic of research in this department is the investigation of the mechanisms of microbe's adaptation to various metabolites and antimetabolites with the aim to alter and guide their metabolism.

Asporogenous yeasts are the object of study, pentoses being the specific inductor.

Easily adaptable to pentoses forms are often met among asporogenous yeasts. Parent strains can grow scanty on pentoses and slowly oxidize them. After adaptation growth and the rate of oxidation are increased. It was established that adaption is possible only with strains which at last in small degree respond to pentose addition to the medium. Now the question arises — what is the mechanism of adaption? The most probable mechanism includes corresponding changes in heredity under

the action of specific substrate. Nevertheless the hypothesis of mutation and selection cannot be conclusively rejected. The revision of the mechanism of stability in adapted forms is the most difficult question from the methodical point of view. To develop methods for study of these questions is the present task of the department.

It was shown experimentally that the possibility always exists to use such temperature of incubation and inductor concentration which increase the rate of adaptation.

Some work is concerned with attempting to obtain yeast strains capable to grow in vitamin-free media.

DEPARTMENT OF PHOTOSYNTHETIC MICROORGANISMS.

Head: S. V. G o r u n o v a.

Physiology of growth and development of various species of microscopic algae are studied. The aim of the work is to learn the role of these microorganisms in natural processes, the interaction of microalgae among themselves and with other microorganisms, to obtain microalgae in artificial culture and preserve species of academic and practical importance.

Expedition are conducted periodically in various parts of USSR in order to take samples from natural conditions and to obtain microalgae in monocultures. The culture obtained are purified from bacterial contamination.

At the same time a study of biochemical composition of algae (the study of protein specificity in particular) and of oxidative metabolism in *Protococcus* group is being made.

DEPARTMENT OF PHYSICO-CHEMICAL METHODS IN RESEARCH.

The task of this department is to construct new apparatus necessary for research work. New equipment is constructed and tested in collaboration with those members of other departments who are interested in its use.

PILOT PLANT

The cultivation of microorganisms in 100-litre fermenters is carried out. Substances of microbiol origin (antibiotics, enzymes etc.) are produced isolated and purified. The testing of these substances is performed in collaboration with suitably organizations,

INTERNATIONAL RELATIONS

Institute of Microbiology has extensive scientific relations with microbiologists abroad.

These relations are carried through correspondence with scientists of other nations as well as invitation of foreign scientist to the USSR for lecturing and consultation. A number of the Institute Staff members go abroad annually for participation in International congresses and symposia and for visiting foreign Institutes and carrying there experimental work on definite problems.

The Institute of Microbiology is willing to place at the disposal of interested microbiological organizations abroad lectures and consultations of its most expert specialists.

Exchange of publications is being made. The articles of scientists of the Institute are published in foreign periodicals. The articles of foreign scientists are published in Russian in the journal "Microbiologija".

PUBLISHING ACTIVITY

The main part of the scientific output of the Institute is published in Russian language in the bimonthly periodical «Microbiologija» («Микробиология») and in «Works of the Institute of Microbiology» («Труды Института микробиологии»). Vol. 1—5 of these «Works» published in 1951—1958 present some scientific results achieved in Institute and other research units. Since 1959 the content of each volume of «Works» is centered around some selected topics.

Vol. 6. 1959. Биохимия и физиология микроорганизмов.
Biochemistry and physiology of microorganisms.

Vol. 7. 1960. Влияние обработки почвы на микробиологические процессы.
The effect of soil treatment on microbiological activity.

Vol. 8. 1960. Биология отдельных групп актиномицетов-продуцентов антибиотиков.
Biology of some groups of antibiotic producing actinomycetes.

Vol. 9. 1961. Геологическая деятельность микроорганизмов.
Geological activity of microorganisms.

Vol 10. 1961. Экспериментальное получение полезных форм микроорганизмов.
Experimental gaining of useful forms of microorganisms.

Following works of prominent Russian scientist have been published under the editorship of Institute Staff:

Исаченко Б. Л. Избранные труды. Т. I—II. Под ред. А. А. Имшенецкого. 1951.

Issachenko B. L. Selected works. Vol. I—II. Editor A. A. Imsheneckii. 1951.

Виноградский С. Н. Микробиология почвы. Под ред. А. А. Имшенецкого. 1952.

Winogradskii S. N. Microbiologie du sol. Editor A. A. Imsheneckii. 1952.

Омелянский В. Л. Избранные труды. Т. I—II. Под ред. А. А. Имшенецкого. 1953.

Omeliansky V. L. Selected works. Vol. I—II. Editor A. A. Imsheneckii. 1953.

Буткевич В. С. Избранные труды. Т. I—II. Под ред. А. А. Имшенецкого. 1957.

Butkevich V. S. Selected works. Editor A. A. Imsheneckii. 1957.

Костычев С. П. Избранные труды по физиологии и биохимии микроорганизмов. Т. I—II. Под ред. А. А. Имшенецкого. 1956.

Kostychev S. P. Selected works in physiology and biochemistry of microorganisms. Vol. I—II. Editor A. A. Imsheneckii. 1956.

The scientist of the Institute have published following monographs:

Гольдин М. И. Вирусные включения в растительной клетке. 1954.

Goldin M. I. Virus inclusions in plant cell. 1954.

Горюнова С. В. Химический состав и прижизненные выделения сине-зеленой водоросли *Oscillaria splendida* grew. 1950.

Gorunova S. V. Chemical composition and intravital extensions of a blue-green algae *Oscillaria splendida* grew. 1950.

Иерусалимский Н. Д. Азотное и витаминное питание микробов. 1949.

Ierusalimsky N. D. Nitrogen and vitamin nutrition of microorganisms. 1949.

Имшенецкий А. А. Микробиологические процессы при высоких температурах. 1944.

Imsheneckii A. A. Microbiological processes at high temperatures. 1944.

Имшенецкий А. А. Отбор активных рас *Penicillium*. 1951.

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Красильников Н. А. Актиномицеты-антагонисты и антибиотические вещества. 1950.

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- Мишустин Е. Н. Термофильные микроорганизмы в природе и практике. 1950.
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